NOTICE

All drawings located at the end of the document.

ER/WM&I DDT

N/A

Source/Driver: (Name & Number from ISP, IAG milestone, Mgmt. Action, Corres. Control, etc.)

Closure #: (Outgoing Correspondence Control #, if applicable)

Due Date

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Document Subject:

TRANSMITTAL OF THE FINAL PROPOSED ACTION MEMORANDUM FOR THE SOURCE REMOVAL AT TRENCH 1, IHSS 108, REVISION 4 - AMT-080-97

KH-00003NS1A July 24, 1997

Discussion and/or Comments:

Please find enclosed *the Final Proposed Action Memorandum for the Source Removal at Trench 1* for submittal to the Environmental Protection Agency (EPA) for approval. There were no public comments received during the Public Comment Period; however, recent comments from the Department of Energy have been incorporated as appropriate. Enclosed are four copies for Kaiser-Hill, five copies for the DOE, and four copies for the EPA. If you have any questions regarding this document, please contact Mark Burmeister at extension 5891.

Attachments:
As Stated

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RMRS Rocky Mountain Remediation Services, L.L.C.
...protecting the environment

FINAL PROPOSED ACTION MEMORANDUM FOR THE SOURCE REMOVAL AT TRENCH 1 IHSS 108

Environmental Restoration
Rocky Flats Environmental Technology Site

July 23, 1997
Revision 4

FINAL
PROPOSED ACTION MEMORANDUM
FOR THE SOURCE REMOVAL AT
TRENCH 1
IHSS 108

July 23, 1997

Revision 4
Document Control Number RF/RMRS-97-011

PROPOSED ACTION MEMORANDUM
FOR THE SOURCE REMOVAL AT TRENCH 1
IHSS 108

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ACRONYMS

AHA	Activity Hazard Analysis
ACE	Activity Control Envelope
ALF	Action Levels and Standards Framework
APEN	Air Pollution Emissions Notification
AOC	Area of Contamination
ARARs	Applicable or Relevant and Appropriate Requirements
cm/s	Centimeters Per Second
CAMU	Corrective Action Management Unit
CCR	Colorado Code of Regulations
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
COC(s)	Contaminant(s) of Concern
CSS	Contaminated Soil Stockpile
CWTF	Consolidated Water Treatment Facility
DOE	Department of Energy
EPA	Environmental Protection Agency
ft	Feet
FIDLER	Field Instrument for the Detection of Low Energy Radiation
HEPA	High Efficiency Particulate Air
HASP	Site-Specific Health and Safety Plan
HRR	Historical Release Report
IHSS	Individual Hazardous Substance Site
LDRs	Land Disposal Restrictions
LLRW	Low Level Radioactive Waste
M2D	Mean plus Two Standard Deviations
mg/l	Milligrams Per Liter
mg/kg	Milligrams Per Kilogram
mrem	Millirem
NESHAP	National Emission Standards for Hazardous Air Pollutants
NEPA	National Environmental Policy Act
OSHA	Occupational Safety and Health Administration
PA	Protected Area
PAM	Proposed Action Memorandum
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene or Perchloroethene
pCi/g	Picocuries Per Gram
pCi/l	Picocuries Per Liter
PPE	Personal Protective Equipment
ppm	Parts Per Million
RACT	Reasonably Available Control Technologies
RCRA	Resource Conservation and Recovery Act
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site
RMRS	Rocky Mountain Remediation Services
RWP	Radiological Work Permit
RFI/RI	RCRA Facility Investigation/Remedial Investigation
SAP	Sampling and Analysis Plan
SVOC	Semivolatile Organic Compound
TCE	Trichloroethene

ACRONYMS (Cont.)

TCLP	Toxicity Characteristic Leaching Procedure
TDU	Thermal Desorption Unit
TUs	Temporary Units
TVOC(s)	Total Volatile Organic Compound(s)
UCL	Upper Confidence Limit
VOC(s)	Volatile Organic Compound(s)
WAC	Waste Acceptance Critria

1.0 PURPOSE

This Proposed Action Memorandum (PAM) outlines the project approach and applicable requirements for the excavation and subsequent segregation and treatment of depleted uranium chips and associated soils and wastes at Trench 1 (T-1), Individual Hazardous Substance Site (IHSS) 108. IHSS 108 is located within the Buffer Zone Operable Unit. T-1 is ranked number five (of over 200 sites) in the Environmental Ranking [Attachment 4 to the Rocky Flats Cleanup Agreement (RFCA), DOE, 1996]. T-1 received a high ranking because it is the single largest known volume of radioactive material buried at the Rocky Flats Environmental Technology Site (RFETS). At this time, T-1 is not expected to be a source of volatile organic compounds (VOCs), or other regulated contaminants. The location of T-1 is shown on Figure 1-1.

The proposed accelerated action is to reduce the risk posed to future users of the site by removing and stabilizing the potentially pyrophoric uranium from the trench and removing and treating (if necessary) debris, contaminated soils, and other material that may be contained in the trench.

Environmental remediation of T-1 will consist of excavation of the materials in the trench, segregation of contaminated and uncontaminated soils and materials, treatment of depleted uranium to a stabilized form, and packaging and off-site disposal of the stabilized waste and other contaminated materials. The proposed accelerated action will remove depleted uranium and/or soils above RFCA Tier I action levels for radionuclides or VOCs. The T-1 area will also be reclaimed at the end of the action. Achievement of remediation goals will be verified through confirmation sampling.

This source removal is being conducted in accordance with the RFCA, and Federal, State, and local laws, as well as U.S. Department of Energy (DOE) Orders and RFETS policies and procedures, including quality assurance requirements. Following stabilization by encapsulation, the depleted uranium and associated materials addressed by this action are expected to be Low Level Radioactive Waste (LLRW). Remedial activities performed under this PAM will be consistent with and contribute to the efficient performance of anticipated long-term remedial action for the buffer zone and will be conducted in a manner which is protective of site workers, the public, and the environment.

2.0 PROJECT DESCRIPTION

T-1 is located just northwest of the inner east gate, and about 40 feet south of the southeast corner of the Protected Area (PA) fence (Figure 1-1). The trench is approximately 250 feet long, 16 to 22 feet wide, and 10 feet deep. Historical documentation indicates depleted uranium metal chips (lathe and machine turnings) packed in lathe coolant were buried in the west end of T-1 in approximately 125 drums. The drums were reportedly double stacked end-on-end in the trench and covered with one to two feet of soil. No written documentation exists for the contents of the center and east end of the trench. Interviews with former site workers indicate that the eastern two-thirds of the trench is likely to contain trash (pallets, paper) and debris such as empty or crushed drums.

Under this proposed action, the drums of depleted uranium chips and incidental contaminated soils will be excavated and treated to stabilize the potentially pyrophoric nature of the uranium chips. Soils with high levels of depleted uranium above RFCA Tier I action levels will also be excavated and stabilized, as required. The stabilized wastes and contaminated soils will be packaged and shipped off-site for disposal as described below in Section 3.4, Waste Management.

The available historic information and recent characterization data do not indicate that T-1 is a source of VOC contamination to subsurface soil or groundwater. If extensive VOC contamination above Tier I action levels is encountered in the trench, these materials would be temporarily stored pending treatment by low temperature thermal desorption. The thermal desorption process has been used successfully at similar sites at RFETS.

2.1 Background

Drums of waste from Building 444 were first placed in T-1 in November 1954 and burial operations continued intermittently until December 1962. Wastes were initially buried in T-1 when Building 444 could not safely process drums of depleted uranium turnings that were combustible and presented a pyrophoric hazard. The pyrophoric nature of this waste made transporting the depleted uranium (often called tuballoy or D-38) a safety hazard. The depleted uranium chips were in drums which also contained lathe coolant (primarily a mixture of water, mineral oil, fatty amides), dirt and other foreign material. Historical information indicates other wastes are buried in T-1 from Building 444 including ten drums of cemented cyanide, one drum of "still bottoms" and "copper alloy." The east end of the trench is expected to contain crushed drums, broken pallets, debris and trash.

The depleted uranium casting and machining began in Building 444 in 1953 (Chem Risk, 1992). The production operations in Building 444 were conducted to support war reserve, special order and manufacturing development work. Weapons components were fabricated from various materials such as depleted uranium, beryllium, stainless steel, and aluminum (EG&G,1993). Operations in Building 444 included casting, fabrication, assembly, inspection and testing, coating and heat treating, plating, special projects and support operations. Machining operations included turning, facing, boring, milling, and sawing of the above materials using lathes, saws, milling equipment and other conventional machine tools (EG&G, 1994; EG&G,1991). In 1956 the chip roaster began operation in Building 447 to roast depleted uranium chips from the machining processes conducted in Building 444. The roaster was out of service from 1959 to 1961 (EG&G, 1991). The waste depleted uranium chips in lathe coolant, dirt, and floor sweepings were stored on the Building 444 dock before the roaster became operational and during the roaster shutdown period. It was during these periods that wastes from Building 444 went to T-1.

2.2 Existing Conditions

The T-1 area was investigated during the Operable Unit 2 Phase II Resource Conservation and Recovery Act (RCRA) Facility Investigation/Remedial Investigation (RFI/RI) Program (DOE, 1995). Additional characterization was conducted as part of the 1995 Trenches and Mound Site investigation (RMRS 1996). Due to the suspected presence of pyrophoric uranium and its associated hazards, no drilling or subsurface sampling was performed inside of the T-1 boundaries.

The T-1 area was investigated in 1995 using the following methodologies:

- Historical data were compiled using the Historical Release Report (HRR) (DOE, 1992) and supplemented with employee interviews to identify buried materials, potential contaminants, trench location, and trench size.
- Aerial photographs were examined to identify disturbed areas, verify trench dimensions and location, and determine time of operation.
- A site visual survey was performed to identify physical features and establish a geophysical sampling grid.
- Electromagnetic and Ground Penetrating Radar surveys were conducted to locate buried conductive and/or metallic objects and define trench boundaries.
- Soil gas surveys were conducted to identify and delineate potential contaminant plumes.

Historical records and information obtained through employee interviews indicate that 125, 30-gallon and 55-gallon steel drums containing 10,000-20,000 kilograms of depleted uranium chips and turnings, and miscellaneous debris were disposed in

T-1. Drum inventory lists, memoranda, and drum shipping logs documenting the placement of 85 drums in T-1 have been located. The inventory lists and former employee interviews indicate that the depleted uranium waste disposed in T-1 originated from Building 444. The uranium chips and turnings were coated with a water-soluble lathe coolant (trade name CimCool) during machining of parts. The inventory records also include ten drums of cemented cyanide waste from Building 444. Cyanide and cadmium wastes are known to have been generated during metallurgical operations in Building 444.

A pilot-scale 55-gallon drum evaporator was reportedly used in Building 444 for reducing machine coolant oil waste volume (DOE, 1992). The resulting condensate was transferred to the process waste treatment system in Building 774 (Hornbacher, 1994), and the "still bottoms" were "drummed and buried through normal disposal channels" (Rains and Hawley, 1955; Cichorz, 1970). "Still bottoms" from Building 444 could potentially consist of either the lathe coolant sludge discussed above or still bottoms from the recovery of residual trichloroethene and perchloroethene waste solvents and sludge generated from machined parts cleaning.

Several of the drums containing depleted uranium and lathe coolant oil are described in historical documents as 30-gallon drums placed inside 55-gallon drums and then over packed with graphite. The graphite is believed to have been excess material derived from waste graphite molds utilized during production operations in Building 444.

Personnel directly involved in the trench disposal activities stated that the buried 30- and 55-gallon drums were generally double-stacked in the trench on-end (vertically), in rows of 4 to 5 drums across. The trench is estimated to be approximately 10 feet deep, 16 feet wide, and 200 to 250 feet long. This correlates well with investigation results. The bulk of the drums containing depleted uranium were reportedly disposed in the west portion of the trench from 1954 to 1962. Individual groups of drums were reportedly completely covered with one to two feet of soil immediately after placement in the west end of T-1. Miscellaneous debris was placed mostly in the central and eastern portions of the trench until the trench was closed in 1962. The drums and debris were covered with one to two feet of soil.

Weed cutting activities in October and November, 1982 unearthed two drums not adequately covered with fill material. Both drums were sampled and the liquids were transferred to Waste Processing for disposal. One drum is documented to have contained an oil/water mixture which yielded plutonium analyses of 55 picocuries per liter (pCi/1) and uranium analyses of 2.3×10^5 pCi/1. The other drum is documented as having contained an oily sludge which yielded results of 4.3 picocuries per gram (pCi/g) plutonium and 1.2×10^6 pCi/g uranium (Illsley, 1983).

Based on this information, conflicting data exists regarding the potential contaminants in the trench. All references that mention the origin of the waste confirm that it was from Building 444 exclusively. It is believed from interviews with retired Rocky Flats employees and the HRR that Building 444 processed uranium and not plutonium; yet, several references state that analytical results from the two drums uncovered in 1982 indicated the presence of low levels of plutonium (DOE, 1992). The presence of low levels of plutonium (if detected) will not affect the project approach in terms of selected treatment of waste. The project safety envelope is protective for the anticipated levels of radioactivity regardless of isotope. The on-site radiological controls (Radiological Work Permit [RWP] and Health and Safety Plan [HASP]) will contain specific radiological hold points. If a radiological stop work is reached, work is temporarily suspended for re-evaluation. Restart will be in accordance with 10 CFR 835, (Occupational Radiation Protection) as implemented through the Site Radiological Control Manual.

2.2.1 Physical Characteristics of Depleted Uranium

Depleted uranium is a radioactive metal that is also potentially combustible. Its radioactivity does not affect its combustibility. The radioactivity hazard is extremely low, and uranium is generally considered a greater toxic hazard as a heavy metal, although considerably less toxic than lead.

Most metallic uranium is handled in massive forms, and does not present a significant fire risk, unless exposed to a severe and prolonged external fire. Once ignited, massive uranium burns very slowly with virtually no visible flame. Burning uranium will react violently with solvents such as carbon tetrachloride, 1,1,1-trichloroethane, and the halons.

Fresh uranium in the finely divided form is readily ignitable, and fresh uranium scrap (chips and turnings) from machining operations are subject to spontaneous ignition. Once ignited, finely divided uranium would be expected to appear as a bright glowing ember and could quickly reach white hot temperatures. This reaction can usually be avoided by storage under dry (without moisture) conditions. Moist dust, turnings, and chips react slowly with water to produce hydrogen and uranium oxide. Under a moist, slightly oxidizing atmosphere, however, uranium corrodes slowly. The heat generated from slow corrosion is not sufficient to ignite the uranium.

Many metals, including uranium, form protective oxide films during the initial stages of oxidation. A coating of oxide greatly reduces the ability of the metal to ignite. Uranium that is completely oxidized is not pyrophoric. Finer-grained material will oxidize completely and more quickly than massive material.

The depleted uranium chips in T-1 were stored in a water-based coolant (CIMCOOL). Conversations with the CIMCOOL manufacturer and the material safety data sheet indicate that CIMCOOL is 65 % water, and the remainder is a combination of fatty amides, tall oil fatty acids, mineral oil, nitrite, formaldehyde, pink dye, dithanolintrosmide, and silicone antifoam. It is not a hazardous material, and is not volatile. The manufacturer notes that prior to use, the CIMCOOL is diluted with 80 % water, so that the coolant as used is over primarily water.

The depleted uranium chips and turnings in T-1 have been in the ground, stored in a water-based coolant for 40 years. It is reasonable to expect that many of the drums have degraded enough to have lost the liquid lathe coolant originally covering the chips. Chips that have been exposed to air within the drum are expected to be oxidized. Some drums may still be intact, and contain the lathe coolant originally covering the chips. Since oxidation of uranium by water can also produce hydrogen gas, there is potential for hydrogen build-up in the drums if they are air-tight. Since hydrogen could pose an explosion hazard in an intact drum, suspected intact drums will be pierced and vented with non-sparking tools prior to removing from the excavation.

Chips within intact drums still covered by coolant are expected to be partially oxidized from the presence of a large amount of water in the coolant. It is unlikely that fresh surfaces of small particle size material have remained intact (unoxidized) for 40 years, and since hydrogen is lighter than air, it will tend to diffuse upward out of drums and out of the soil. However, in order to plan and maintain an adequate safety envelope, the project is being designed and planned to address the potential for hydrogen build-up and a fire.

Water is generally acceptable for use as an extinguishing or cooling agent for fires involving uranium. Water will be utilized at the site for dust control and as an extinguishing medium. The preferred agent for extinguishment is a sodium-chloride based powder (MET-L-X). This dry powder is non-combustible and secondary fires do not result from its application to burning metal. MET-L-X extinguishers and sodium-chloride based sand will be available at the site.

2.3 Hydrogeologic Setting

The hydrogeologic setting consists of 12 to 25 feet of poorly consolidated Rocky Flats Alluvium and disturbed soil unconformably underlain by bedrock consisting of weathered claystone and minor sandstones of the Cretaceous Arapahoe and Laramie Formations (DOE, 1995). The Rocky Flats Alluvium consists of lenses of poorly to moderately sorted clayey and silty gravels and sands interbedded with clay and silty lenses. Mean hydraulic conductivities are 2×10^{-4} centimeters per second (cm/s) for the Rocky Flats Alluvium and 8.8×10^{-7} cm/s for the weathered claystone of the Arapahoe Formation (EG&G, 1995). The T-1 area consists of one to two feet of artificial fill deposits over the Rocky Flats Alluvium. The surface soils in the vicinity of T-1 were extensively disturbed during the creation and removal of the Mound Site, construction of the Protected Area fence, excavation of the Central Avenue ditch, and other construction activities in the area (DOE, 1995).

The locations of boreholes and wells used to characterize the T-1 area are presented in Figure 2-1. Groundwater in the vicinity of the T-1 site seasonally ranges in depth from approximately 10 feet to 22 feet below ground surface. In May 1995, during the wettest spring in 25 years, groundwater was measured at approximately 6 feet below ground surface. The bottom of the trench has been estimated to be about 10 feet below ground surface. As such, groundwater occasionally reaches the level of the drums in the trench.

Seasonal recharge from the ground surface and the unlined Central Avenue ditch causes shallow groundwater to flow towards the north. Figure 2-2 depicts the generalized hydrogeologic cross section at the T-1 site. An east-west trending bedrock high is located between the 903 Pad and the T-1 area, just south of the trench (DOE, 1995). Groundwater within the saturated alluvium south of the trench has been interpreted to flow eastward, along the south side of the bedrock high.

2.4 Trench 1 Characterization Data Summary

Evaluation and characterization of the environmental conditions in the vicinity of T-1 was conducted using available data compiled from the OU 2 Phase II RFI/RI report (DOE, 1995) and the Draft Trenches and Mound Site Characterization Report (RMRS, 1996). Subsurface soil and groundwater data evaluated include analytical results from three boreholes and five groundwater monitoring wells installed near the west portion of T-1 in 1986, 1987, and 1991. In addition, a limited soil gas survey was performed at the trench site to screen for VOCs. Electromagnetic and ground penetrating radar surveys were conducted at the site in 1995 to locate buried conductive objects and define the trench boundaries.

Because no drilling or subsurface sampling has been performed inside of the T-1 boundaries, the available subsurface soil and groundwater data may not characterize the trench contents. However, because this source removal action is focused on removing and stabilizing the drums of depleted uranium known to be in the trench, complete environmental characterization of the trench and immediate area is not required to perform the T-1 accelerated action.

Due to limited number of borehole and monitoring well locations in the vicinity of the trench, the available data are not sufficient to state conclusively that T-1 is contributing to subsurface soil and groundwater contamination in the T-1 area. Based on review of this limited available data for T-1 there does not appear to be significant subsurface soil or groundwater contamination with a source in T-1. A summary of the T-1 characterization data is presented below.

2.4.1 Groundwater

Groundwater data was obtained for five monitoring wells (4386, 2387, 12091, 1891, and 1791) near the west portion of T-1 (see Figure 2-2). Well 4386 is screened in the Rocky Flats alluvium. The remaining wells are screened in weathered claystone of the Arapahoe Formation (DOE, 1995). Because of the limited well placement, no data is available for groundwater flowing beneath the central and eastern portions of the trench.

Wells 12091 and 1891 are located approximately 10 feet south of the southern boundary of the trench, approximately 40 feet east of the southwest corner of the trench boundary. These two wells are likely hydraulically upgradient or cross-gradient to the trench (see Figure 2-1). Monitoring wells 4386 and 2387 are located about 130 feet and 75 feet west of the west trench boundary, and are located cross-gradient and/or upgradient to the trench. The remaining well 1791 is approximately 45 feet hydraulically downgradient (north) of the western portion of the trench. Groundwater sample results for the upgradient wells (12091, 1891, 4386, and 2387) and the downgradient well (1791) are summarized in Table 2-1.

Low concentrations of tetrachloroethene (PCE) and trichloroethene (TCE) were detected in all five monitoring wells. The PCE measured in the downgradient well 1791 exceeded the RFCA Tier II groundwater action levels. However, PCE also exceeds this action level in upgradient well 2387 (see Figure 2-1). There are not enough data available to determine whether PCE in groundwater at well 1791 is from either the same sources as well 2387, or from a source in T-1. The presence of contamination in wells upgradient and/or cross-gradient to T-1 has been linked to the 903 Pad and other potential sources.

Methylene chloride was detected in wells 2387, 12091, 1891, and 1791. Methylene chloride is a common laboratory and sampling analytical contaminant. It is not known to have been used extensively as a solvent at RFETS. Therefore, PCE and TCE are used as indicators of groundwater contamination in relation to T-1.

Dissolved uranium-233/234, and uranium-238 activities observed in all five wells exceed Tier II groundwater action levels. However, all of these activities are within the background uranium ranges of the respective isotopes as defined by the mean plus two standard deviations (M2D).

TABLE 2-1
SUMMARY OF GROUNDWATER SAMPLE RESULTS

ANALYTE	WELL 4386	WELL 2387	WELL 12091	WELL 1891	WELL 1791	TIER II ACTION LEVELS	BACKGROUND (M2D)	UNITS
Methylene Chloride	ND	0.008	0.016	0.007	0.022	0.005	NA	mg/l
Tetrachloroethene	0.0003	0.074	0.00059	0.002	0.016	0.005	NA	mg/l
Trichloroethene	<0.005	<0.005	0.0003	<0.0002	0.001	0.005	NA	mg/l
Plutonium-239/240	-0.20	0.0250	ND	ND	ND	0.151	0.01	pCi/l
Americium-241	0.11	0.10	ND	ND	ND	0.151	0.013	pCi/l
Uranium-233/234	9.858	3.60	5.643	5.0	4.0	2.98	60.7	pCi/l
Uranium-235	0.301	0.30	0.279	1.0	1.0	1.01	1.79	pCi/l
Uranium-238	7.629	2.20	4.337	3.0	4.0	0.768	49	pCi/l

Notes:
All concentrations reported are maximum observed.
All concentrations reported for metals and radionuclides are for dissolved analyses.
ND = Not Detected
NA = Not Applicable
mg/l = milligrams per liter
pCi/l = picocuries per liter
Values used for the radionuclide background comparisons are the background M2D. These values were obtained from the draft Background Comparison for Radionuclides in Groundwater report (DOE, 1997).

2.4.2 Soil

Subsurface soil samples were collected from three boreholes (BH3487, BH3587, and BH3687) in the vicinity of T-1 (see Figure 2-1). The boreholes are located well outside of the trench area. Subsequently, the available borehole data does not represent subsurface conditions within the trench. Subsurface soil sampling from beneath the bottom of the trench was attempted by using angle drilling methods, but was unsuccessful due to the amount and size of cobble material encountered.

Organic Compounds in Soil

Results from the Phase II RFI/RI investigations and the Trenches and Mound Site Characterization indicate that no VOC, semivolatile organic compound (SVOC), or polychlorinated biphenyl (PCB) concentrations detected in the vicinity of T-1 exceed the RFCA Tier II subsurface soil action levels.

Metals in Soil

Cadmium was detected in subsurface soil samples collected from borehole BH3487 [2.0 to 3.1 miligrams per kilogram (mg/kg)], BH3587 (2.2 to 3.3 mg/kg), and BH3687 (2.0 to 2.4 mg/kg). This concentration is below both Tier I and Tier II action levels for cadmium in subsurface soils in the proposed open space area. Arsenic was detected at 14 mg/kg in borehole BH3587 at a depth of 18 to 19 feet. These concentrations are below Tier I and above Tier II action levels for arsenic in subsurface soils in the proposed open space area. Arsenic was not detected at shallow depths in this borehole.

Radionuclides in Soil

Available analytical results for radionuclides in soil are summarized in Table 2-2 for comparison to RFCA Tier II subsurface soil action levels. None of the radionuclide activities exceeded the RFCA Tier II action levels. Plutonium-239/240 and americium-241 activities detected in each of the three boreholes generally decreased with depth, indicating the sources of these radionuclides are likely present in or near the surface. The maximum plutonium-239/240 activity (1.5 pCi/g) was observed from the 0 to 12 foot sample interval in borehole BH3587. Borehole BH3687 was observed with 1.7 pCi/g uranium-238 from the surface to 5 feet and 2.2 pCi/g uranium-238 at a depth of 18 to 20 feet (see Figure 2-1).

For completeness, the Tier II values for individual radionuclides, as defined in RFCA, were compared to the subsurface soil samples collected from the boreholes to evaluate potential dose. Results of this evaluation indicate that neither the RFCA Tier I or Tier II subsurface soil action levels for radionuclides were exceeded for any of the fifteen samples collected. However, it is anticipated that uranium activities in subsurface soil immediately beneath T-1 will exceed RFCA Tier I subsurface soil action levels, as determined using the specified sum-of-ratios method for multiple radionuclides. Confirmation soil samples will be collected to determine the extent of excavation.

TABLE 2-2
SUMMARY OF RADIONUCLIDE RESULTS FOR SUBSURFACE SOIL

BOREHOLE	SAMPLE DEPTH (ft)	ANALYTE	CONCENTRATION (pCi/g)	TIER II(*) SUBSURFACE SOIL ACTION LEVELS (pCi/g)
BH3487	8 to 14.7	Plutonium-239/240	0.09	252
	17 to 18	Plutonium-239/240	0.06	252
BH3587	0 to 12	Americium-241	0.40	38
	0 to 12	Plutonium-239/240	1.5	252
	12 to 15	Americium-241	0.02	38
	12 to 15	Plutonium-239/240	0.06	252
	14 to 15	Americium-241	0.06	38
	18 to 19	Americium-241	0.03	38
BH3687	0 to 5	Americium-241	0.12	38
	0 to 5	Plutonium-239/240	0.53	252
	0 to 5	Uranium-238	1.7	103
	5 to 15	Americium-241	0.03	38
	18 to 20	Americium-241	0.04	38
	18 to 20	Plutonium-239/240	0.03	252
	18 to 20	Uranium-238	2.2	103
	23 to 25	Americium-241	0.08	38

* Based on an annual dose limit of 15 millirem to a hypothetical future resident, based on presence of a single radionuclide only.

Soil Gas Survey

Soil gas samples were collected at depths of five and ten feet below ground surface at 25 sample locations around the perimeter of the trench to screen for total volatile organic compounds (TVOCs) using an organic vapor analyzer. No samples were collected within the trench boundaries because of the suspected presence and potential hazards associated with pyrophoric uranium. The soil gas survey results are presented in Figure 2-3.

Elevated levels of TVOCs were detected in 19 of 25 sample locations ranging from 11 parts per million (ppm) to 1,999 ppm at site 020. The TVOC levels detected north of the trench boundary were generally higher than those observed to the south. The highest TVOC result was measured at sample location 020, approximately 25 feet south of the southern trench boundary. To the north of the trench higher TVOC readings were encountered in boreholes further from the trench (006A and 009A). The survey results do not show a definite trend in TVOC concentrations with depth or location in the vicinity of the trench. Based on the limited data obtained, no source from within the trench area was identified. This conclusion was based on comparison of the soil gas survey data with that from other areas with known VOC sources. The soil gas survey was performed in the spring of 1995, the wettest spring in 25 years. Although soil gas surveys are unreliable if conducted when the vadose zone contains high water content and the water table is high, it is reasonable to conclude that T-1 is not a major source of TVOCs.

Electromagnetic and Ground Penetrating Radar Surveys

Two electromagnetic surveys were performed to locate buried conductive objects and define the trench boundaries. Both surveys identified anomalies representing areas within the trench most likely to contain buried metallic objects. The anomalies were identified in the west end, and to a lesser extent in the east end of the trench. The anomalies vary in size from 10 to 24 feet wide and indicate that the trench is approximately 200 feet in length.

Ground penetrating radar surveys were performed to determine the extent of T-1. The surveys indicated that the trench width varies from 10 to greater than 20 feet. The GPR survey results show that the trench is approximately 6 to 10 feet deep. The geophysical survey results are consistent with information obtained from the interviewed employees formerly associated with T-1 activities.

3.0 PROJECT APPROACH

The proposed accelerated action will entail excavating drums containing depleted uranium chips in lathe coolant, soils with radionuclide activity at or above RFCA Tier I action levels, and other wastes and debris from T-1. Materials will be segregated as they are removed from the trench, and further segregated in a staging area. Depleted uranium chips will be stabilized by encapsulation to address their potential pyrophoricity. Associated radiologically contaminated soils will be excavated, treated if necessary, and staged for off-site disposal. The project will be conducted in accordance with applicable regulations (See Section 5.0), RFCA, DOE Orders, and RFETS policies and procedures. The project will also utilize lessons learned from previous accelerated actions conducted at RFETS and other DOE - complex sites.

Process selection - Several alternative processes for the stabilization of the potentially pyrophoric depleted uranium wastes were evaluated for this project. The treatment alternatives analysis is part of the project file. The processes evaluated were thermal oxidation, chemical oxidation, and stabilization by encapsulation. All three processes have been successful in converting pyrophoric uranium to a stable, non-reactive form. Thermal oxidation requires extensive off-gas treatment to control emissions. Chemical oxidation can produce both chlorine and hydrogen gas during the process and may not be appropriate for the anticipated mixture of soils, lathe coolant and other impurities. Both thermal and chemical oxidation would produce waste streams in addition to stabilized uranium oxide. These waste streams would require further stabilization or treatment prior to disposal. Thermal and chemical oxidation would both require pre-treatment of the waste, and separation of coolant, soils, and other material from the depleted uranium. Stabilization of the uranium chips by cementation type processes was selected based on the simplicity of the process, its ability to handle uranium chips coated with lathe coolant and mixed with soil and debris, and its history as a safe, proven technique for converting the depleted uranium to a non-reactive form.

3.1 Proposed Action Objectives

Objectives of the proposed accelerated action are to remediate the risk posed to future users of the site by removing and stabilizing the potentially pyrophoric uranium from the trench and removing and treating (if necessary) contaminated debris, soils, and other material that may be contained in the trench. Soils above RFCA Tier I action levels (except if the limiting conditions described in section 3.2.1 are met) for radionuclide activity will be removed from the trench, treated as necessary, and staged for disposal. Upon completion of the accelerated action, the trench will not contain depleted uranium or soils contaminated above RFCA Tier I action levels for radionuclides or VOCs, and the T-1 area will have been reclaimed to pre-excavation conditions.

3.2 Proposed Action

This action will involve excavating both the drums of depleted uranium chips and approximately 250 cubic yards of soil associated with the depleted uranium in the west end of the trench, and excavating the debris and associated potentially contaminated soils (1,000 to 1,500 cubic yards) in the eastern two-thirds of the trench. Potentially pyrophoric uranium chips will be stabilized in a cementation-type process to remove the hazard of pyrophoricity along with contaminated soils associated with the uranium above Tier I action levels for radiological activity. Other wastes suspected in the west end of the trench such as cemented cyanide solutions (10 drums) and "still bottoms" (1 drum) will also be excavated, sampled, treated as necessary, and staged for appropriate off-site disposal.

Soils will be screened, segregated and stockpiled. If present, and of sufficient volume to warrant, VOC-contaminated soils above Tier I action levels will be staged for subsequent treatment using a low temperature thermal desorption remediation technology. Upon attainment of thermal desorption unit (TDU) performance goals, the treated VOC soil will be backfilled into the excavation following analysis to confirm contaminant concentrations are below the TDU performance goals to be determined. Offsite treatment and disposal of low volumes of VOC-contaminated soils may be utilized. If significant VOC-contaminated groundwater is identified during the project, post-closure groundwater monitoring may be required. Details of a proposed groundwater monitoring program would be described in the project Closeout Report. The monitoring program would address both groundwater and potential surface water contamination.

Soils with radionuclide activity levels at or above RFCA Tier I action levels will be segregated, stockpiled, and staged for disposal. Soils with radionuclide activity levels below the RFCA Tier II action levels will be returned to the trench. Soils with radionuclide activity levels below Tier I and greater than Tier II levels will be disposed of offsite or returned to the trench within a geotextile fabric. The geotextile fabric will allow for future retrieval of the soil if required. The remainder of the trench will be filled with clean backfill, and the top 6 inches will be covered with topsoil. The trench and associated areas used for the accelerated action activities will be reclaimed.

3.2.1 Excavation

Conventional excavation techniques will be used to remove the soil, drums, debris, and contaminated soils at the T-1 site. Excavation equipment will consist of a track-mounted excavator, backhoe, and/or front-end loader. The excavator bucket will be equipped with brass or bronze teeth to minimize spark-potential while handling drums containing depleted uranium. Drums will be removed from the excavation individually, one-at-a-time, in order to minimize exposure to workers, environment, and the public. Site controls will be utilized for both intact and non-intact drums, as specified in the Field Implementation Documents. Standard fire prevention and suppression techniques for pyrophoric metals will be utilized. Extinguishing agents for the potentially pyrophoric depleted uranium chips will be located immediately adjacent to the excavation site and ready for use. Soils, drums, and debris will be moved in dump trucks, roll-offs, or by similar transport to a staging/segregation area, described in Section 3.2.2.

During drum and soil handling activities, dust minimization techniques, such as water sprays, will be used to minimize suspension of particulates. In addition, earth-moving operations will not be conducted during periods of sustained high winds. The RFETS Environmental Restoration Field Operations Procedure FO.1, Air Monitoring and Particulate Control, will be incorporated into the project. A series of continuous air sampling stations deployed around the RFETS perimeter, including additional sampling stations located around the T-1 site will be utilized. Air monitoring for radioisotopes, VOCs, and particulates will be performed throughout the project, and be detailed in the HASP.

When the excavation is inactive, such as downtime or the end of work shifts, exposed drums in the trench will be covered with soil and potentially pyrophoric materials will be contained in a fire-safe configuration.

At the completion of excavation, verification samples will be collected along the base and sides of the excavation to determine the post-action condition of the subsurface soils. Samples will be analyzed according to the Sampling and Analysis Plan (SAP). This sampling will be performed after an initial nominal six inch scrape below the drums and debris to clear the trench bottom of any slough material. Visible staining which may extend beneath the trench bottom will also be removed prior to collecting samples. If analytical results indicate that contamination is present above Tier I action levels, further excavation and sampling will continue until the clean-up target levels listed in Table 3-1 have been met, or the limiting condition (top of unweathered bedrock) is met.

If contamination is encountered below the bottom of the trench, the excavation will be limited to the highly weathered bedrock, one to three feet below the alluvial/bedrock contact, or to the depth of groundwater, if encountered. Unweathered bedrock will not be excavated. An organic vapor analyzer and a field instrument for the detection of low energy radiation (FIDLER) will be used as field screening tools to guide excavation activities before collection of the excavation verification samples.

Cleanup target levels used for the excavation activities are the RFCA Tier I soil action levels (DOE, 1996) for radionuclides, cyanide, and VOCs, if encountered. These action levels were incorporated to reduce risk to future site workers and users of the site, and to prevent degradation of groundwater quality above the RFCA Tier I groundwater action levels (DOE, 1996). Table 3-1 lists the radionuclide, VOC, and cyanide cleanup target levels for excavation per RFCA (DOE, 1996). The contaminants listed in Table 3-1 are the potential chemicals of concern *(COCs)* for the project. This list was developed by assessing the historical data, retired worker interviews, and waste records from the site, and by the use of process knowledge to ascertain what contaminants existed in the drums that were initially buried at the site. If additional COCs are identified during the project, the action level for these contaminants will be designated as the Tier I subsurface soil action levels.

TABLE 3-1
CONTAMINANT OF CONCERN
CLEANUP TARGET LEVELS FOR EXCAVATION

Contaminant	Activity or Concentration
Uranium (U-238)	586 pCi/g
Cyanide	154,000 mg/kg
PCE	11.5 mg/kg
TCE	9.27 mg/kg

Radiological monitoring of the soils will be performed for protection of the workers, the public, and the environment in accordance with 10 CFR 835 and the RFETS Radiological Controls Manual (K-H, 1996). If levels of radioactivity are encountered in the soil greater than three times background, the soils will be segregated and further sampling and evaluation will be performed to compare radioisotopic concentrations with RFCA subsurface soil action levels.

Based on available site characterization data, no recoverable free product is expected in the trench. Free product, if present, would likely remain in the soil when excavated and small lenses or pockets when disturbed during excavation will be absorbed by surrounding soils. Visibly stained areas of the excavation will be removed. If a sufficient amount of recoverable VOC or other hydrocarbon free product is encountered, the free product would be containerized, characterized, and appropriately disposed offsite.

Based on historical groundwater level measurements in the vicinity of T-1, groundwater is not expected to be encountered during excavation activities. If groundwater and/or incidental water is encountered during excavation, a field pump will be used to transfer the water into a temporary storage container onsite.

As part of the Mound Site Source Removal project, a culvert extension within the existing Central Avenue ditch, located north of T-1, has been installed which will minimize local groundwater recharge to the T-1 area. Surface water monitoring will be performed during excavation activities using existing automated stations near the site, and storm water run-on and run-off around the excavation will be controlled with the use of berms.

3.2.2 Staging/Segregation of Contaminated Materials and Soils

Drums containing waste materials, drum fragments, debris, etc. will be evaluated for inclusion into the stabilization process and segregated accordingly. Liquids and sludge, if encountered, will be segregated and managed appropriately. Uranium chips to be stabilized, debris, and other waste materials will be transported to the treatment area. Wastes not suitable for stabilization will be packaged and disposed of appropriately.

Drums containing waste materials, drum fragments, debris, etc. will be segregated based on field screening. Each drum or artifact will be evaluated, and inventoried. First, materials will be segregated according to suspect radiological contamination, suspect hazardous contamination, or suspect mixed contamination (contaminated with both a radiological and hazardous component). Drums will be inspected for labels, markings, texture, color, and any other information which may assist in identification. Solid materials will then be segregated and assigned to one of the following waste types: depleted uranium chips and turnings, cemented cyanide wastes, suspected "classified" artifacts, debris, wastes potentially containing hazardous constituents, or unknown materials.

Drums identified as containing uranium chips, and/or uranium chips in a soil matrix will be containerized and transported to the treatment area for stabilization. These materials and wastes should be easily identifiable by visual inspection, radiation screening, and by their location within the trench.

Cemented cyanide wastes will be re-packaged and sampled in accordance with the SAP. Sampling results will be used to verify the material waste type, characterize the waste for applicable storage, disposal, and treatment options (if required), and/or resolve whether the present waste form is acceptable for disposal. The re-packaged waste material will be stored in a Temporary Unit (TU) established for storage of wastes during this project.

Artifacts suspected as being "classified" items will be immediately isolated and packaged appropriately. The RFETS Classification Office will be contacted to remove the artifact, and store it in a secure location.

Miscellaneous debris is expected to include compatible materials such as waste personal protective equipment (PPE), wood, rubber, plastics, paper, and glass excavated from the trench. These items will be visually inspected for stains or discolorations, in addition to radiological and volatile organic screening. In general, these items are anticipated to be low level radioactive waste materials unless hazardous characteristics are indicated. These materials will be packaged appropriately with like waste forms for disposal.

Materials which cannot be immediately identified will be containerized, and sampled to identify the contents. Once the material is identified, it will be disposed of properly.

Liquids and sludge, if encountered, will be segregated and managed appropriately. The excavated containers will be inspected for labels, markings, or other information which may indicate its contents. The liquids/sludge will be screened for radiological and volatile organic contamination and will be re-packaged if required, in order to ensure container integrity. After container integrity is assured, the liquids will be stored within secondary containment. If the liquids/sludge cannot be identified, the material will be sampled to determine its characteristics.

During the excavation, exposed soils will be screened for volatile organic compounds and radioactivity using appropriate instrumentation and analysis. Soils that appear stained or discolored or appear to possess chemical or radiological contamination will be automatically segregated as suspect-contaminated to ensure waste minimization. Soils suspected to be clean will be staged and stockpiled for reuse in backfilling and restoration of excavations. Sampling of suspect-clean soil and suspect-contaminated soil will be performed according to the SAP.

Soils excavated directly from the areas of the trench containing waste drums, debris, etc. may possess hazardous or radiological characteristics. It is anticipated that T-1 received containers as well as many loose items. Visual indicators may include miscellaneous debris and particulates mixed in with soils, staining and discoloration, odors, or other indications from field instruments that indicate the soils may be contaminated.

Soils suspected to be either radiologically or VOC-contaminated will be temporarily staged in either roll-off containers or contaminated soil stockpiles (CSSs), in the northeast trenches area. This site was chosen because it is relatively flat and contains support trailers and utilities from the previous environmental restoration projects at RFETS. The CSSs will be designed to contain the contaminated soil and minimize wind blown dispersion and storm water interaction with the soil by using concrete barriers and a water-resistant tarpaulin. In addition, a plastic lined ditch will be constructed surrounding the stockpile to capture local stormwater. Storm water collected from this ditch may be used to control dust on soils awaiting treatment or will be collected for onsite treatment at the Consolidated Water Treatment Facility (CWTF) in Building 891. Air monitoring for VOCs, particulates, and radioisotopes will be performed during staging of soils in the CSSs. Dust minimization will be performed during the staging of soils in the CSSs and a water-resistant tarpaulin or equivalent will be placed after daily stockpiling operations.

Water collected from the excavation or from within the CSS bermed areas (if any) will be managed as incidental waters per site procedure 1-C91-EPR SW.01. If the water requires treatment, it will be treated in the CWTF located in Building 891. Following treatment, the water will be sampled and released in accordance with discharge criteria.

3.2.3 Treatment

A stabilization process will be utilized as appropriate to encapsulate uranium metal chips, and incidental radioactively contaminated soils, and other low-level radioactive debris associated with the depleted uranium recovered from the trench. Soil and debris with radionuclide activity levels above RFCA Tier I action levels, not intimately associated with the depleted uranium waste, will be excavated, treated if necessary, and staged for disposal. Stabilization involves mixing the wastes with a stabilization agent to form a solid monolith. Encapsulation within the monolith isolates the uranium from oxygen and moisture, rendering it stable and non-reactive. Stabilization techniques can be sensitive to the presence of oils or solvents. If these materials are detected, the stabilization mixture may be modified, or the oils/solvents may be separated and containerized (e.g. gravity separation or filtration). Following stabilization, the monolith will be sampled to support off-site disposal waste acceptance criteria, and will include analysis by the EPA Toxicity Characteristic Leaching Procedure (TCLP) for metals, VOCs, and reactivity. These activities will be conducted within a temporary containment structure.

The temporary structure (e.g., Sprung Instant Structure) would provide a sealed environment for performing treatment operations. The structure would be constructed near T-1 with secondary containment for spill control, and would be equipped with a high efficiency particulate air (HEPA) filter system to control potential airborne contaminants. The structure would be constructed of flame retardant materials and would be designed to shed snow and withstand high winds and hail in accordance with the applicable building codes and standards.

As a contingency, if sufficient VOC-contaminated soils and debris are present to justify the expense, a low-temperature TDU will be used to remove the VOCs from contaminated soils in a non-destructive manner. If thermal desorption is used, the TDU will be similar to that described in the Mound PAM (DOE, 1996), and the performance goals for the VOCs would be as discussed for the Mound project. Soil would be staged pending mobilization of a TDU. The thermal desorption process has been used successfully at similar sites at RFETS, and is a cost effective treatment method.

3.2.4 Site Reclamation

At the completion of remediation activities, radiological surveys of the T-1 Site excavation and treatment areas will be performed and the areas will be revegetated. Radiological surveys of the equipment will be performed per the RFETS Radiological Control Manual (K-H, 1996) prior to release from RFETS. Excavation, stabilization, and all other treatment support equipment will be decontaminated. Revegetation will be performed in accordance with guidance from RFETS ecologists using approved seed mixtures.

3.3 Worker Health and Safety

Due to the contaminants present in T-1, this project falls under the scope of the Occupational Safety and Health Administration (OSHA) construction standard for Hazardous Waste Operations and Emergency Response, 29 Code of Federal Regulations (CFR) 1910.120 Under this standard, a Site-Specific Health and Safety Plan (HASP) will be developed to address the safety and health hazards of each phase of site operations and specify the requirements and procedures for employee protection. In addition, the DOE Order for Construction Project Safety and Health Management, 5480.9A, applies to this project. This order requires the preparation of Activity Hazard Analyses (AHAs) to identify each task, the hazards associated with each task, and the precautions necessary to mitigate the hazards. The AHAs will be included in the HASP.

An Activity Control Envelope (ACE) process is being utilized to develop the safety envelope for performing the T-1 remediation. The ACE team consists of a group of individuals with varied training and backgrounds relevant to the T-1 project, and includes subject matter experts on treating potentially pyrophoric depleted uranium, nuclear safety, health and safety, radiation control, excavation processes, waste handling and treatment, as well as the DOE project representative. The ACE team will evaluate associated hazards for each of the activities. These analyses will be incorporated into the HASP. A nuclear safety analysis is also being performed for the T-1 project in parallel with the ACE review. The nuclear safety analysis will consider the safety of site workers (project and collocated) and off-site populations. Any specific requirements of the nuclear safety analysis that are not covered by the ACE hazard analysis will also be incorporated into the HASP. The ACE process is evaluating special safety and radiological concerns of handling depleted uranium drums in an unknown condition and configuration, including fire hazard, radiological and chemical exposure.

This project could expose workers to physical, chemical, and low levels of radiological hazards. Physical hazards include those associated with excavation activities, use of heavy equipment, noise, heat stress, cold stress, and work on uneven surfaces. In addition, there is potential for a uranium chip fire. Fire safety will be addressed in the HASP and in a job-specific fire prevention and response plan.

Physical hazards will be mitigated by engineering controls, administrative controls, and appropriate use of PPE. Chemical hazards will be mitigated by the use of PPE and administrative controls. Appropriate skin and respiratory personal protective equipment will be worn throughout the project. Routine VOC monitoring will be conducted with an organic vapor monitor for any employees who must work near the drums of waste or related contaminated soil.

The HASP details project "radiological hold points," to address contaminated debris, contaminated drums, or removable contamination above limits. Radiation monitoring will be included in the HASP per the RFETS Radiological Control Manual (K-H, 1996).

If field conditions vary from the planned approach, (ie. unexpected conditions) an activity hazards analysis will be prepared for the existing circumstances and work will proceed according to the appropriate control measures. Data and safety controls will be continually evaluated. Field radiological screening will be conducted using radiological instruments appropriate to detect surface contamination and airborne radioactivity. As required by 10 CFR 835, Radiation Protection of Occupational Workers, all applicable implementing procedures will be followed to insure protection of the workers, collocated workers, the public, and the environment. The HASP will describe the air monitoring equipment to be used to monitor for radiation, VOCs, and particulates. Air monitoring will be performed in accordance with applicable procedures which includes project site and perimeter (Radioactive Ambient Air Monitoring Program [RAAMP]) monitoring throughout project duration. Dust minimization techniques will be used to control suspension of contaminated soils and particulates. Air monitoring activities may vary dependent on field activities.

3.4 Waste Management

Stabilized depleted uranium chips and associated soils and metal debris, e.g. drum carcasses, will be packaged to meet the waste acceptance criteria (WAC) of the receiving facility, and will be stored onsite pending final off-site disposition at either a low-level or low-level mixed waste repository. Waste associated with the stabilization process will be screened for radiological contamination. If this waste is not radioactive or RCRA hazardous it may be placed in a sanitary waste landfill.

Metal and other debris including empty drums will be decontaminated if possible and/or practical, and placed in the on-site landfill. If the debris cannot be radiologically decontaminated, it will be sized and packaged for off-site disposal as low-level waste. Sizing will be performed with equipment designed (e.g. portable hydraulic drum crushers) and people trained to perform that function. HEPA filters (if any) from the temporary stabilization facility may contain low levels of radionuclides and will be managed on-site until they can be sent off-site to an approved disposal facility. Any secondary wastes generated as part of this proposed action, such as personal protective equipment (PPE), will be characterized based on process knowledge and radiological screening. Wastes identified as non-radiological and non-hazardous will be disposed in a sanitary waste landfill. Wastes identified as hazardous or low level/low level-mixed will be stored on-site pending shipment off-site to an appropriate disposal facility. Wastes will be managed, recycled, treated, and /or disposed of in accordance with RFETS policies and procedures, and in accordance with applicable Federal, State and local laws and regulations. The Closeout Report for the project will document the types, volumes, and disposition of all wastes generated by this project.

4.0 ENVIRONMENTAL IMPACTS

The National Environmental Policy Act (NEPA) requires that actions conducted at the RFETS consider potential impacts to the environment. While no separate NEPA documentation is required for this action, RFCA does require DOE to address NEPA values, i.e., consideration of the environmental impacts of the proposed action and of alternatives as part of this PAM. The no action alternative was considered, but has been rejected. The no action alternative is unacceptable because it would result in no improvement to the contaminated soil resources or the risk to the environment of leaving the waste in place. The risk to human health and the environment as evidenced by T-1's high ranking in RFCA Attachment 4 is sufficient that this accelerated action is recommended.

There are no continuing long-term air quality impacts after the project is complete. Short-term impacts associated with the project will be mitigated by dust suppression techniques and excavation controls. Air quality impacts are discussed further in sections 5.1.1 and 5.2.7. Dusts generated during the stabilization process will be controlled by engineering controls, including use of a temporary structure to cover the segregation and stabilization process area. Surface water and groundwater quality and wetlands impacts are not anticipated. The excavation area will include run on and run off controls to prevent stormwater from contacting the wastes. Only limited, temporary changes to groundwater flow (if any) are anticipated due to the small area excavated, and the depth of excavation, which will be above the average groundwater table. Clearance for concerns related to the Migratory Bird Treaty Act and threatened and endangered species will be obtained from RFETS ecologists prior to any construction/excavation activity. Conferences and/or consultations, as needed, will also be held with the United States Fish and Wildlife Service.

The excavation and stabilization areas have been disturbed over the past forty years. This action is not anticipated to have direct or indirect, or irreversible and irretrievable impacts to natural resources at RFETS and ultimately the action will improve natural resources by removing a known source of nadionuclide acitivity in the soil. Revegetation will mitigate any impacts caused by this action and the previous disturbances. Impacts to the soil's ability to support vegetation following excavation and backfill will be addressed. Topsoil of sufficient quality will be utilized to support revegetation. Given the relatively small area of excavation and backfill, and the project's short duration, impacts to fauna will also be limited and of short duration. Because the project is located away from any surface water, wetlands, or habitat suitable for the threatened and endangered species known to inhabit RFETS, impacts to threatened and endangered species and migratory birds are not anticipated. Periodic surveys for these species will be conducted per RFETS procedures. Historic and cultural resources are not present at the T-1 site. If any cultural/historic objects or resources are encountered, applicable site procedures will be followed.

Human health impacts are addressed through requirements for worker protection, and requirements to control the dispersion of contamination to air, water, and soil. The native vegetation has already been disturbed. A net improvement in resource quality will occur and will be consistent with both the short and long term uses anticipated at RFETS. Cumulative impacts will be extremely limited or nonexistent due to the project's short duration. Areas disturbed during the project will be revegetated per guidance from RFETS ecologists. Historic impacts to soil and potential impacts to groundwater will be reduced.

5.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

RFETS accelerated actions performed under a PAM must attain, to the maximum extent practicable, federal and state applicable or relevant and appropriate requirements (ARARs). For that reason, the substantive attributes of the federal and state ARARs must be identified.

In addition, RFCA incorporates section 121(e)(1) of CERCLA so that the procedural requirement to obtain federal, state, or local permits is waived for accelerated actions conducted in the buffer zone. (RFCA ¶16.a.). T-1, the containment building, and any temporary units (TUs) will all be located in the buffer zone. For each permit waived, RFCA requires identification of the substantive requirements that would have been imposed in the permit process (RFCA ¶17). Further, the method used to attain the substantive permit requirements must be explained (RFCA ¶17c). The following discussion is intended to complement other descriptions provided in this PAM in a manner that satisfies the CERCLA permit waiver requirements.

5.1 Chemical-Specific Requirements and Considerations

The only chemical-specific ARAR identified was the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities. In addition, the RFCA Action Levels and Standards Framework for Surface Water, Groundwater, and Soil (ALF) Tier I subsurface soil action levels were identified as to-be-considered.

5.1.1 NESHAPs

40 CFR Part 61, Subparts A and H (Colorado Code of Regulations (CCR) 5 1001-3, Regulation No. 8, Part A, Subparts A and H) are the applicable NESHAP. This regulation requires limitation of RFETS radionuclide emissions to meet an annual public dose (dose to an off-site member of the public) standard of 10 millirem (mrem); monitoring of significant emissions points; EPA/CDPHE

notification and approval (state permit) prior to construction or modification of radionuclide sources with emissions exceeding a 0.1 mrem threshold; and annual reporting of the site's radionuclide emissions which demonstrates compliance with the 10 mrem standard.

The estimated maximum radionuclide dose to the public from this project will be approximately 0.20 mrem effective dose equivalent (EDE). This result represents a preliminary estimate based on radionuclide emissions from excavation and from exposure of radionuclides to the atmosphere over the course of the project (no emission control has been assumed). It does not include additional emissions that may occur due to material handling activities, stockpiles, and resuspension from wind erosion. The dose was estimated for the most impacted off site individual (southeast of RFETS near Mower Reservoir) using the EPA approved CAP88-PC dispersion model.

Ambient air monitoring data collected during an earlier remediation project suggests that the actual dose to the public could be higher than the dose estimated in this preliminary analysis due to uncertainties in the estimation of the source term and the predictive capability of the CAP88-PC model. Assuming a factor of 10, as suggested by these data, an EDE of approximately 2.0 mrem would result.

In addition, there is a potential that some of the depleted uranium material may burn upon exposure to the atmosphere which would cause additional dose. This estimated dose increase could be as much as 0.005 mrem per kilogram uranium burned.

Because the proposed remediation of Trench 1 is a CERCLA project, EPA/CDPHE notification and approval is only being required through the PAM process and not as part of obtaining any state or federal permit, even though the estimated dose from the project exceeds the 0.1 mrem threshold (see 40 CFR§ 61.106). Records will be kept, as needed, of project parameters sufficient to estimate dose for annual compliance reporting.

The preliminary evaluation has not attempted to specifically estimate radionuclide emissions that could be released from the treatment enclosure or thermal desorption unit, if needed. If uncontrolled emissions from any point source are estimated to exceed 0.1 mrem, source monitoring is required and will be implemented.

In summary, the T-1 project emissions, when combined with other RFETS emissions will not exceed 10 mrem to any member of the public in any year.

5.1.2 Action Level Framework

The Tier I subsurface soil action levels provided in the RFCA ALF were considered and adopted as the cleanup target levels for uranium and cyanide. Similarly, if sources of VOCs are encountered, the ALF Tier I subsurface soil actions levels will be adopted as the cleanup target levels. (See Table 3-1).

The ALF subsurface soil action levels for radionuclides are based upon the approach taken in DOE's notice of proposed rulemaking, Radiation Protection of the Public and the Environment, 10 CFR Part 834, (see 58 FR 16268), and in EPA's staff working draft of the EPA Radiation Site Cleanup Regulation, 40 CFR Part 196. Because neither the ALF, the proposed 10 CFR 834 or the draft 40 CFR 196 are duly promulgated, they cannot be ARAR but were considered when subsurface soil action levels were selected.

5.2 Action-Specific Requirements and Considerations

The following action-specific requirements and considerations were evaluated specific to the T-1 project:

- Definition of Remediation Waste
- Identification and Listing of Hazardous or TSCA (PCB) Wastes
- Land Disposal Restrictions
- Containment Building
- Contaminated Soil Stockpiles
- Temporary Unit Tank and Container Storage
- Particulate, VOC and Hazardous Air Pollution Emissions
- Debris Treatment

5.2.1 Remediation Waste

In RFCA remediation waste is defined as all:

(1) *Solid, hazardous, and mixed wastes;*
(2) *All media and debris that contain hazardous substances, listed hazardous or mixed wastes or that exhibit a hazardous characteristic; and*
(3) *All hazardous substances.*

generated from activities regulated under this Agreement as ... CERCLA response action.... (See RFCA ¶25.bf.).

A parallel definition is also found in 40 CFR §260.10. As such, the definition of remediation waste is applicable to all wastes, environmental media (soil, groundwater, surface water, stormwater and air) and debris generated in conjunction with this action.

5.2.2 Identification and Listing of Hazardous or TSCA (PCB) Wastes

The depleted uranium is exempt from RCRA as a source material. (See 42 U.S.C. §6903 (27)). Regardless, the pyrophoric depleted uranium is sufficiently similar to wastes that exhibit ignitible or reactive characteristics to warrant physical handling in a manner that attains relevant and appropriate ARARs, to the maximum extent practicable, for as long as the uranium remains pyrophoric. The relevant and appropriate management ARARs are identified below in sections 5.2.4, 5.2.5, and 5.2.6.

The historical record indicates that 10 drums of cemented cyanide wastes were disposed in T-1. The cyanide wastes could have originated from either listed electroplating sources or non-listed heat treating activities conducted in Building 444. Because of the uncertainty as to the source, any cyanide waste, soil/waste mixture, debris or wastewater will be considered potentially reactive until tested and determined otherwise. (See 40 CFR §261.23(a)(5)). Where appropriate, any cyanide waste, soil/waste mixtures, debris, or wastewater will be evaluated for other hazardous characteristics.

The operating record reveals only one instance where a single drum of "still bottoms" was disposed in T-1. This occurred during a period where material identified as "perclene still bottoms" were routinely taken to the Mound Site. This drum originated in Building 444 where distillation of lathe coolants also occurred. Given the doubt about T-1 as a source of VOC groundwater contamination, identification of any RCRA listed waste codes as ARAR is not presently justified. If T-1 is identified as a source of tetrachloroethene or trichloroethene groundwater contamination, appropriate ARARs, (e.g., F001 still bottoms from the recovery of tetrachloroethene or trichloroethene used for degreasing) will be identified as ARAR to soil excavation and disposition.

Because characterization of the contents of the trench has not been performed, provisions are being made to segregate materials removed from the trench and, pursuant to the SAP, to screen the materials for unknowns. If the screens indicate possible listed or characteristic hazardous wastes or the presence of PCBs above 50 ppm, additional characterization will be performed and the materials will be managed in accordance with applicable or relevant and appropriate RCRA or TSCA substantive requirements. The screens will also be used to determine if identification of additional Tier 1 subsurface soil action levels is required.

5.2.3 Land Disposal Restrictions

Any waste, soil/waste mixture, debris or liquid that is identified as a hazardous waste requires treatment to the Land Disposal Restrictions (LDR) levels for wastewater or non-wastewaters, as appropriate. (See 40 CFR §268.40 Treatment Standards for Hazardous Wastes).

For reactive cyanide waste, soil/waste mixtures, debris or liquids, treatment to the LDR levels for wastewater or non-wastewaters is required. (See 40 CFR §268.40 Treatment Standards for Hazardous Wastes, D003, Reactive Cyanides Subcategory). D003 reactives are not subject to evaluation of underlying hazardous constituents. (See 40 CFR §268.40(e)).

Remediation wastewaters generated during remediation will be transferred to the CWTF (Building 891) for treatment. If these remediation wastewaters contain listed RCRA hazardous wastes or if the remediation wastewaters exhibit a RCRA characteristic, the RCRA hazardous waste codes would not be applicable or relevant and appropriate because these waste waters are CERCLA remediation wastes being treated in a CERCLA treatment unit. The CWTF will treat the remediation wastewaters to meet applicable surface water quality standards under a National Pollution Discharge Elimination System ARARs framework.

Any waste generated as the result of treatment of a listed waste will be assigned the corresponding waste code. Wastes generated as a result of the treatment of waste water will also be evaluated to determine if they exhibit a hazardous characteristic.

5.2.4 Containment Structure

Waste, soil/waste and debris treatment will be conducted in a temporary containment structure. The requirements include design criteria, operating standards, and closure standards. (See 40 CFR §264.1100).

The design criteria for the containment structure require that the structure be an enclosed, self-supporting structure with a durable primary barrier that is compatible with the wastes being managed. The building must assure containment by preventing exposure to the elements, (e.g., precipitation, wind, run-on) and be of sufficient structural strength to accommodate local geotechnical considerations, climatic conditions, and operational stresses.

For limited management of liquids in the containment structure, secondary containment appropriate to the types and quantities of liquids to be managed will be identified during design of the containment building and implemented as part of construction.

Operationally, the primary barrier must be maintained free of significant cracks, gaps, corrosion or other deterioration. The level of waste within the containment must allow some freeboard above the waste. The structure must be operated to prevent tracking of wastes from the unit by personnel and equipment. Fugitive dust emissions from doors, windows, vents, cracks, etc. must be controlled to a no visible emissions level.

For closure of the containment structure, all wastes and contaminated subsoils must be removed (if appropriate), and structures and equipment will be decontaminated or managed as waste.

Table 5-1 identifies the general RCRA requirements that are being identified as relevant and appropriate to the Containment Structure, the CSSs and the Temporary Units.

In regards to overall RCRA requirements, 40 CFR Part 264 Subpart C, Preparedness and Prevention is addressed in the RFETS RCRA Part B Permit and by RFETS infrastructure. Similarly, 40 CFR Part 264 Subpart D, Contingency Plan and Emergency Procedures is also addressed in the RFETS RCRA Part B Permit and by RFETS infrastructure. 40 CFR Part 264 Subpart E requirements are administrative in nature and will not be applicable or relevant and appropriate.

TABLE 5-1
GENERAL RCRA SUBSTANTIVE REQUIREMENTS

Citation and Title	Requirement
40 CFR §264.13 - Waste Analysis	Satisfied by characterization data used to prepare the PAM. Additional waste characterization data will be collected, as appropriate, in accordance with the SAP.
40 CFR §264.14 - Security	Rely on RFETS infrastructure.
40 CFR §264.15 - General Inspection Requirements	Personnel will inspect equipment during operations as provided in the Field Implementation Plan.
40 CFR §264.16 - Personnel Training	Training requirements will be identified in the project Health and Safety Plan.

5.2.5 Contaminated Soil Stockpile(s)

The contaminated soil stockpile(s) (CSSs) will be located within the large area of contamination east of the plant site where waste management activities were historically conducted. Details on the configuration and operation of the CSSs are provided in section 3.2.2. The movement and stockpiling of wastes within the East Trenches area of contamination will not trigger LDRs (see 55 FR 8760). The CSSs will also be subject to the general RCRA requirements identified in Table 5-1.

For closure of the contaminated soil stockpile(s), wastes and contaminated subsoils must be removed, as appropriate, and structures and equipment will be decontaminated or managed as waste.

5.2.6 Temporary Unit Tank and Container Storage

The establishment of TUs may require a permit exemption if any of the tanks or containers are used for longer than 90-days. Therefore, the discussion in this section is provided to satisfy ¶17 of RFCA.

40 CFR §264.553 provides that temporary tanks and containers used for the storage or treatment of hazardous remediation wastes may be subject to alternative design, and operating and closure requirements as long as the requirements are protective of human health and the environment (See 40 CFR §264.553(a)). The TU must be located within the facility boundary and may only be used for treatment or storage of remediation wastes (See 40 CFR §264.553(b)).

In establishing requirements for TUs seven factors must be considered: the length of time the unit operates; the type of unit; the volumes of remediation waste; the physical and chemical characteristics of the remediation waste; the potential for releases; the conditions at the site that will influence migration; and the potential for exposure if a release occurs. (See 40 CFR §264.553(c)).

In conjunction with the T-1 remediation, all tanks and containers will be compatible with the waste and be in good condition. Where practicable, secondary containment will be provided when liquid wastes are stored or treated in tanks or containers. In addition, the TUs will also be subject to the general RCRA requirements identified in Table 5-1.

For closure of the TUs, wastes and contaminated subsoils must be removed, if appropriate, and structures and equipment will be decontaminated or managed as waste.

5.2.7 Particulate, VOC and Hazardous Air Pollution Emissions

Remediation activities have the potential to generate particulate, radionuclide, fugitive dust, VOC, and HAP emissions. 5 CCR 1001-3, Regulation No. 1, governs opacity and particulate emissions. Regulation No. 1, Section II addresses opacity and requires that stack emissions from the containment structure or fuel-fired equipment must not exceed 20% opacity.

Regulation No. 1, Section III addresses the control of particulate emissions. Fugitive particulate emissions will be generated from soil excavation, transport, and treatment. Control methods for fugitive particulate emission should be practical, economically reasonable, and technologically feasible. During soil handling activities, dust minimization techniques such as water sprays, will be used to minimize suspension of particulates. In addition, earth moving operations will not be conducted during periods of high wind. The substantive requirements that would otherwise be incorporated into a control plan (see Regulation No. 1, Section III.D) are embodied in the RFETS Environmental Restoration Field Operation Procedure FO.1, Air Monitoring and Particulate Control, which will be incorporated into the project. In addition, any fuel-fired equipment such as generators or compressors must comply with a particulate emission limit (See Regulation No. 1, Section III.A).

5 CCR 1001-3, Regulation No. 3, provides authority to CDPHE to inventory emissions. Regulation No. 3, Part A, Section II requires that RFETS submit an Air Pollution Emissions Notification (APEN) CDPHE prior to initiation of the T-1 project. Pursuant to RFCA, RFETS will prepare an APEN to facilitate the CDPHE inventory process.

5 CCR 1001-3, Regulation No. 7, regulates VOC emissions. Regulation No. 7, Section II requires that new sources of VOC utilize Reasonably Available Control Technologies (RACT). VOCs may be emitted during soil excavation, transport, and thermal desorption. Although significant VOC concentrations are not expected, a bounding assumption has been made that approximately 1 ton of VOCs will be emitted from excavation, soil handling, and treatment activities. Based on this assumption, RACT will be attained without implementing specific VOC controls for soil excavation, transport, and thermal treatment. (See Statement of Basis and Purpose, Regulation No. 3, Part D, July, 15, 1993). If significant VOCs are identified, these assumptions and the need for additional controls will be evaluated.

Regulation No. 7, Section III governs the transfer and storage of VOCs and requires bottom or submerged fill for containers greater than 56 gallons. CDPHE has previously given guidance that any liquid containing any amount of an organic compound may be considered a VOC for purposes of this requirement. To the maximum extent practicable, storage tanks and related equipment must be maintained to prevent detectable vapor loss. The project will comply with this requirement which is applicable to containers used to dewater the excavation, used to the transfer of thermal desorption unit condensate, and used to manage decontamination water, if required.

5.2.8 Debris Treatment

Where appropriate, tanks, the project decontamination pad, or the Main Decontamination Facility may be configured to perform low level, hazardous or mixed waste debris treatment in accordance with 40 CFR §262.34, §268.7(a)(4) and §268.45. Specifically, 40 CFR §268.45 Table 1, A.1. e. provides for treatment using high pressure steam and water sprays and 40 CFR §268.45 Table 1, A. 2.a. provides for water washing and spraying. Following treatment, as long as the debris does not exhibit a hazardous waste characteristic, the debris will no longer contain a listed hazardous waste and will no longer be subject to RCRA hazardous waste requirements.

Solid residues from the treatment of debris containing listed hazardous wastes will be collected and managed in accordance with RCRA hazardous waste management ARARs. Any solid residues from debris treatment that exhibit a hazardous waste characteristic will also be managed in accordance with RCRA hazardous waste management requirements.

Liquid residues from the treatment of debris containing listed hazardous wastes are subject to RCRA hazardous waste management ARARs until they are transferred for treatment in the CWTF. Any CWTF residues that result from the treatment of listed debris will carry the same listing as the listed debris from which it originated. Any CWTF residues that exhibit a hazardous waste characteristic will also be managed in accordance with RCRA hazardous waste management ARARs.

5.3 Location-Specific Requirements and Considerations

No location-specific ARARs were identified. Applicable RFETS site procedures and DOE orders will be considered as appropriate.

6.0 IMPLEMENTATION SCHEDULE

The remediation of T-1 is proposed to commence the first quarter of fiscal year 1998. Treatment of contaminated soils, if encountered, is scheduled to begin immediately after the excavation activities during spring/summer 1998. Data reduction and reporting efforts are scheduled to be completed by September 1998. Any delays, scope, or budget changes may affect these dates.

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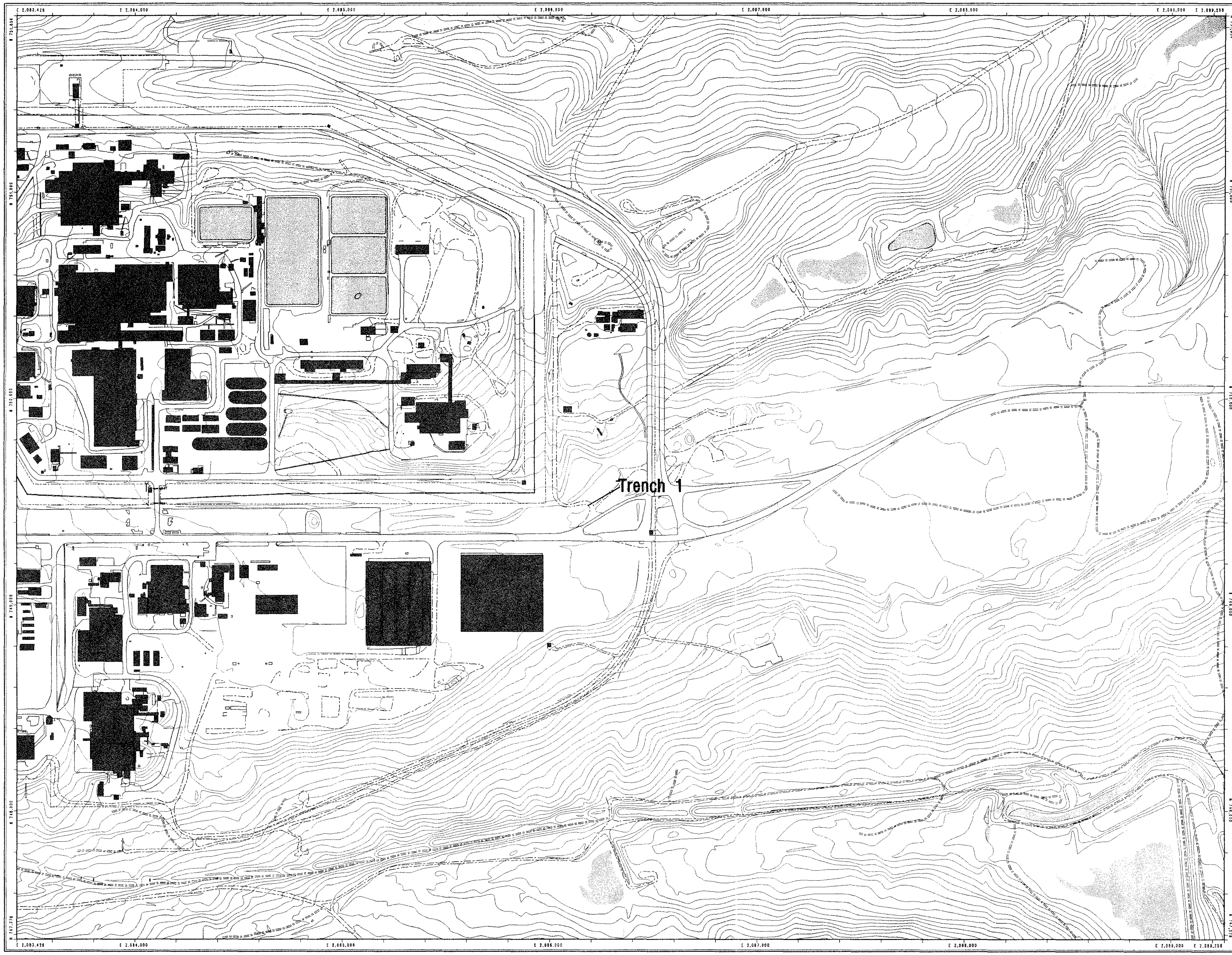

Figure 1-1

Trench 1
Site Location Map

EXPLANATION

Contours (5' intervals)

Trench 1

Standard Map Features

Buildings or other structures

Lakes and ponds

Streams, ditches, or other drainage features

Fences

Paved roads

Dirt roads

DATA SOURCE:
Buildings, roads, and fences provided by Facilities Engr., EG&G Rocky Flats, Inc. - 1991.
Hydrology provided by USGS - (date unknown)

Scale = 1 : 5430
1 inch represents approximately 453 feet

100 0 200 400ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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MAP ID: 97-0066

July 24, 1997

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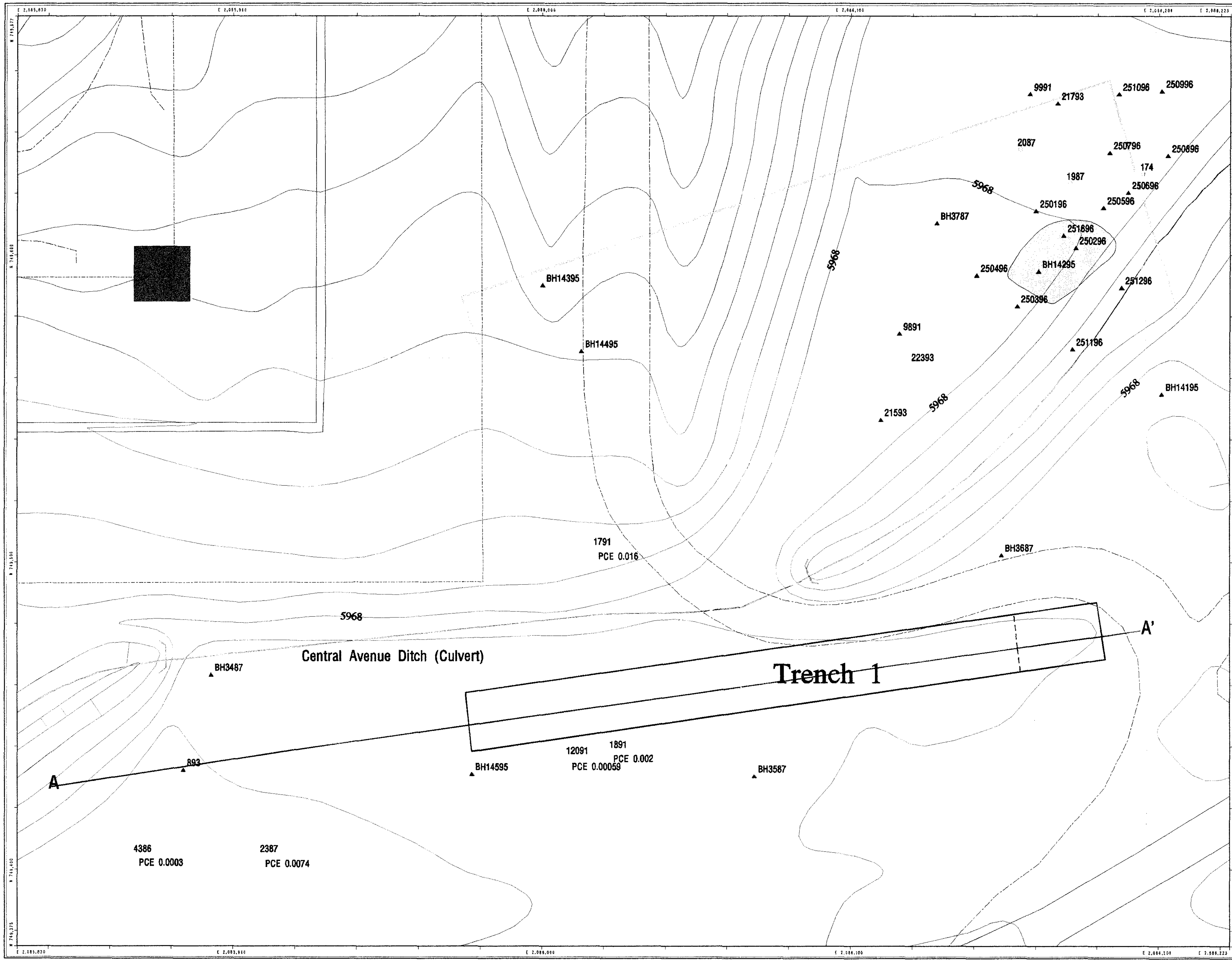

Figure 2-1
Mound and Trench 1 Borehole and Groundwater Well Location Map

EXPLANATION

- Line of Hydrogeologic Cross Section
- Contours (2' intervals)
- IHSS Boundary
- Central Avenue Ditch
- Trench Boundary
- Historical Trench T-1 East Boundary
- Groundwater Well Locations (Note: PCE 0.016 - Tetrachloroethene at 0.016 mg/L)
- Borehole Locations
- Contaminated Area Excavated at Mound Site, April 1997

Standard Map Features

- Buildings or other structures
- Fences
- Paved roads
- Dirt roads

DATA SOURCE:
Buildings, roads, and fences provided by Facilities Engr., EG&G Rocky Flats, Inc. - 1991.
Hydrology provided by USGS - (date unknown)

Scale = 1 : 370
1 inch represents approximately 31 feet

10 0 20 40ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
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MAP ID: 97-0066 July 24, 1997

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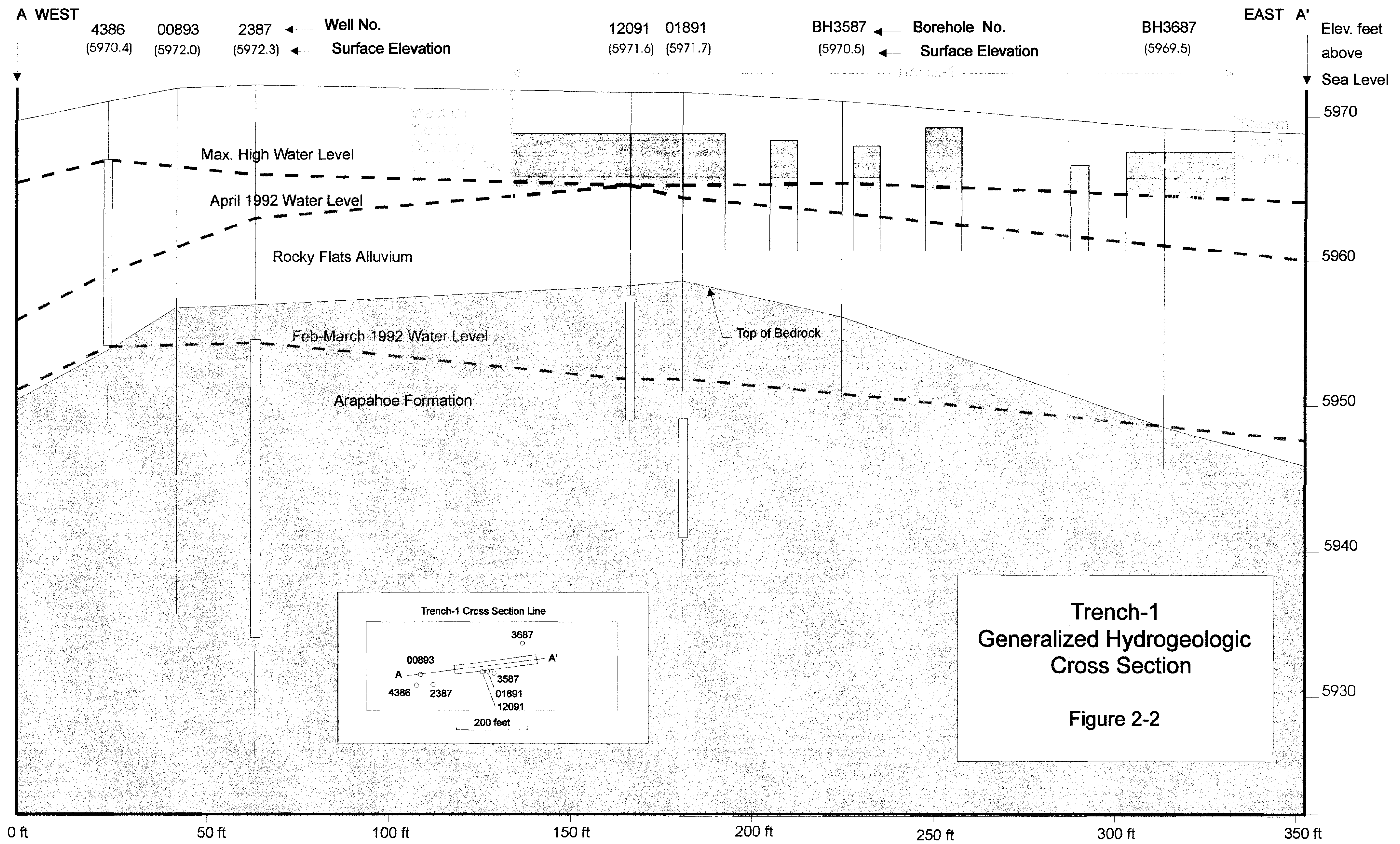

Trench-1
Generalized Hydrogeologic
Cross Section

Figure 2-2

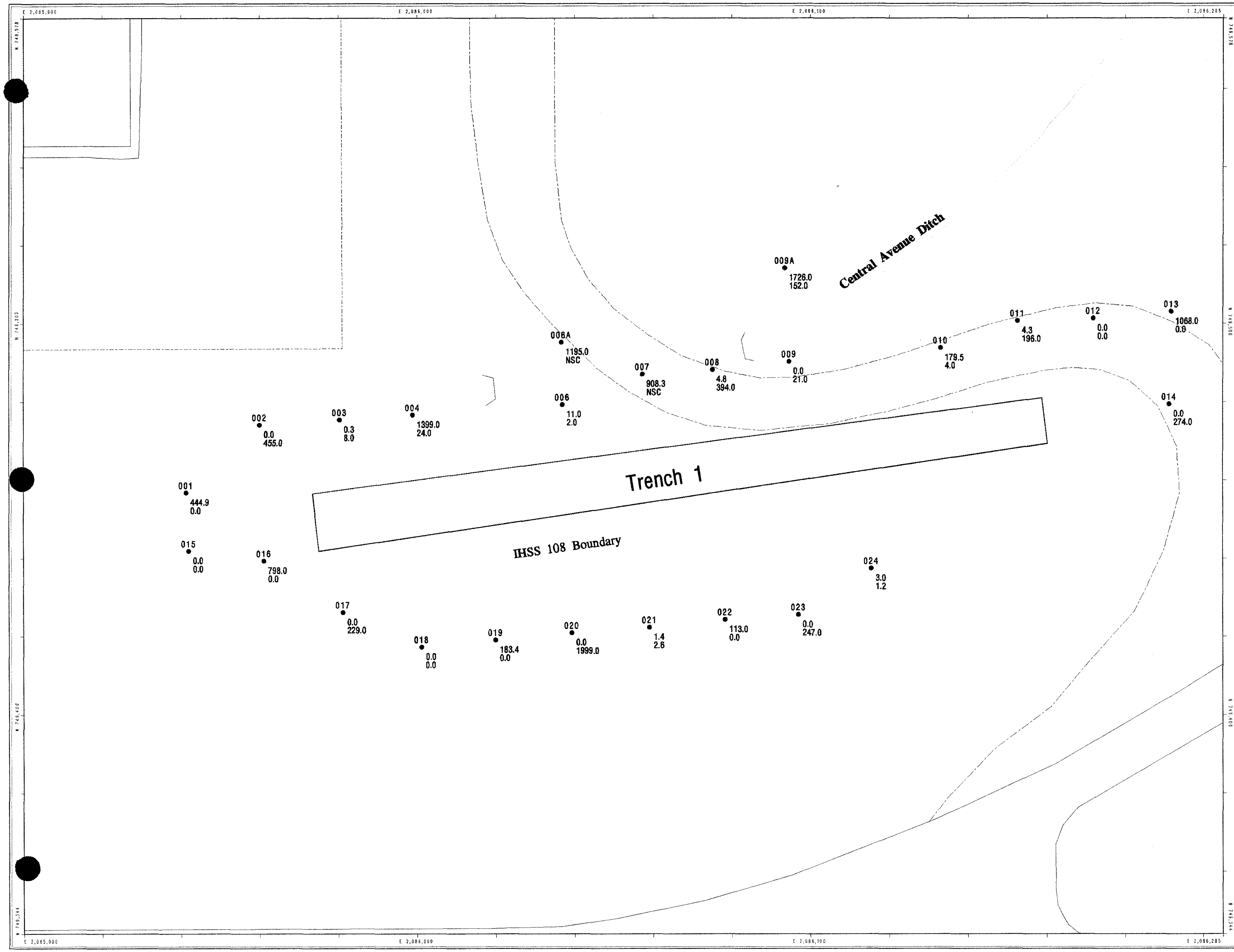

Figure 2-3

Trench 1
Soil Gas Survey Results

EXPLANATION

IHSS Boundary

Trench Boundary

Soil Gas Locations

010
179.5 - Depth 5 Feet
4.0 - Depth 10 Feet
NSC - No Sample Collected

Standard Map Features

Lakes and ponds

Streams, ditches, or other drainage features

Fences

Paved roads

Dirt roads

DATA SOURCE:
Buildings, roads, and fences provided by Facilities Engr., EG&G Rocky Flats, Inc. - 1991.
Hydrology provided by USGS - (date unknown)

Scale = 1 : 280
1 inch represents approximately 23 feet

5 0 10 20ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
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MAP ID: 97-0073

July 23, 1997

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